



# **HARD FACTS** *about* **HARD WATER**

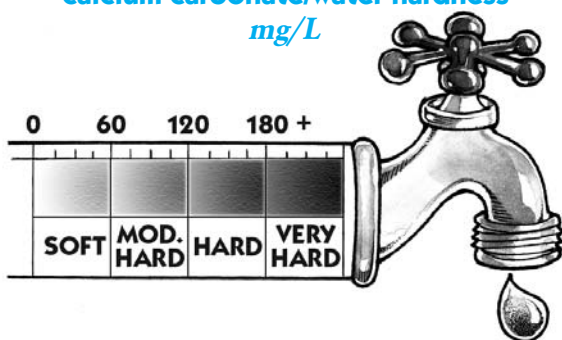


## HARD WATER, SOFT WATER – WHAT'S THE DIFFERENCE?

Water has many different characteristics in different parts of the United States. In some cities the water is hard, in some it is soft. Water in some areas may have a distinctive taste or may have no taste at all. Some water may be cloudy while in another part of the country the water is clear.

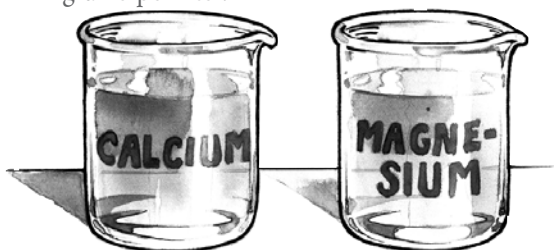
If the water that comes from your faucet leaves deposits in the tub, on your dishes, or in your teapot, it is probably hard water. If you get all kinds of suds from your bar of soap or laundry detergent, the water is probably soft.

**calcium carbonate/water hardness**  
*mg/L*



## WHAT MAKES WATER HARD?

Calcium and magnesium in water are the most common minerals that make water hard. The definition of water hardness is based on the amount of calcium carbonate it contains measured in milligrams per liter.



## WATER HARDNESS IN THE U.S.

The hardness of water varies widely throughout the United States, but for the most part, the states of the southwest and upper midwest have hard water. In the southwest, low rainfall, hot weather, and high mineral content in the soil contribute to water hardness.

## WHICH IS BETTER? HARD WATER OR SOFT WATER?

Since both hard and soft water have positive and negative qualities, public preference varies. Which is most appealing to a family is a highly subjective decision. It really seems to depend on what you get used to.

A comparison of water hardness values in the United States.



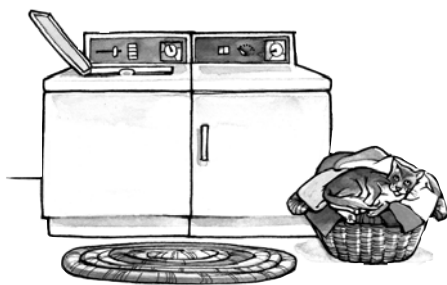
Source: IonPure Technologies Corporation

## WHAT ABOUT THE WATER IN TUCSON?

Most of Tucson's water has always been hard. Water pumped from our arid desert earth contains many minerals. The blend of Colorado River water and groundwater that makes up about half of our water supply in Tucson is about the same hardness as much of our groundwater. Hot, dry weather, limited rainfall, high evaporation rates, and high mineral content in soils all combine to increase the mineral content of water in the southwestern United States. The Colorado River flows for hundreds of miles through country like this on its way to Lake Havasu – the starting point for the Central Arizona Project canal. The hardness of our water in Tucson will continue to rise during the next decade. One of the decisions we will need to make about our water future will be whether to control this change with special treatment facilities or let the hardness increase naturally.

## WHAT DOES HARD WATER MEAN TO ME AT HOME?

The minerals in hard water can cause spots to form on dishes, or a scale to form on showerheads, drip irrigation emitters, evaporative coolers, and kitchen appliances like coffee makers. Water spotting and scaling require more attention. How fast mineral buildups occur depends on how hard the water is at your home. It's important that you follow the manufacturer's guidelines for hard water use in appliances. You also may want to use some descaling products and change some of your cleaning habits.



## HERE ARE SOME OF THE THINGS THAT YOU CAN DO TO LESSEN THE EFFECTS OF HARD WATER AROUND YOUR HOME

### ► THE LAUNDRY

Most laundry products are detergent-based and therefore work better in hard water than soap-based products. Today's detergents are formulated to perform over a wide range of water hardness.

According to the National Soap and Detergent Association, a powdered detergent with phosphate\* will perform well in hard water as will any of the liquid laundry detergents (none of the liquids contain phosphate). If a powdered detergent without phosphate is used, it is important to make sure that the detergent completely dissolves in the wash water. Regardless of the form of detergent you use, you will still need extra detergent to overcome the hardness of the water. For example, if the manufacturer calls for one cup of detergent, you may have to use a cup and a half and then evaluate the results. But remember that using too much detergent, in an effort to get more suds, can leave a residue on clothes. In general, detergents perform better in warm water. Water conditioning and detergent boosting products also are available and are especially effective in hard water. Read the labels of products and experiment to find which works best for you.



With most cleaning products, following the manufacturer's instructions for washing in hard water will get the desired results. Most soap and detergent manufacturers have toll-free customer service numbers if you need more information.

\* Phosphates from detergents in wastewater promote the growth of nuisance plants in streambeds and lakes.

## ► THE DISHWASHER



Hard water will probably cause more spotting and filming on your dishes. This is because the minerals in hard water are released faster when the water comes in contact with heat, such as the heating element in your hot water heater or dishwasher. Here are some things you can do to reduce spotting and filming:

### Reduce the temperature of your hot water heater



The higher the temperature setting on your hot water heater, the more mineral residue will occur in the dishwasher. It is recommended that you turn the water heater down to 130 degrees, or the “vacation setting.” At this setting you should have enough hot water for your shower and you will maintain sanitary conditions in your dishwasher. For every degree or setting that you decrease your hot water heater, you decrease the amount of mineral spotting or filming on your dishware.

### Detergent Selection\*



According to the National Soap and Detergent Association, you should start with the manufacturer’s recommended amount of detergent and increase by one tablespoon at a time until you achieve the desired cleaning/spot prevention. Read the labels of products and experiment to find which works best for you.

### Rinse Agents



To remove heavy, cloudy, hard water film or spotting from dishware, you can add a commercially produced film and spot remover or use regular household white vinegar as a rinse agent. If your dishwasher does not have a dispenser, you can create your own by putting some vinegar in a cup and placing it on a dishwasher rack.

If you use a film and spot remover, make sure to follow the manufacturer’s directions. If you use vinegar, the National Soap and Detergent Association recommends removing flatware or other metal items from the dishwasher.

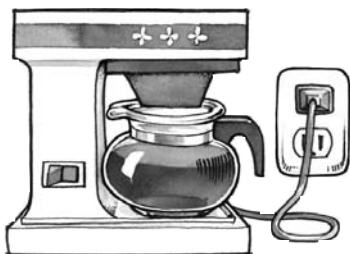


Before you decide which method to use, read your dishwasher operating manual to see what the manufacturer recommends for hard water use.

\* Please see asterisk explanation regarding phosphates on preceding page.

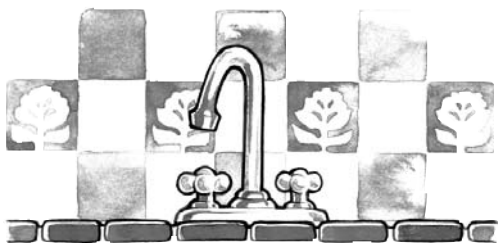
## ► THE COFFEE MAKER

There are products on the market that will remove mineral buildup from your drip coffee maker or you can run a pot of strong vinegar water through your coffee maker on occasion. Refer to the manufacturer's guidelines.



## ► THE HOT WATER HEATER

Decreasing the temperature of the hot water heater will reduce the amount of mineral buildup in the hot water tank, but nevertheless, mineral “scaling” in the tank will eventually reduce the energy efficiency of the heater. Therefore, it is important to follow the manufacturer's guidelines for flushing your hot water heater.



## ► TILE, CERAMIC, AND METAL

Mineral buildup on tile, ceramic, and metal surfaces such as showerheads, sinks, bathtubs, faucet fixtures, and swimming pools will simply require more attention to keep water spotting and filming to a minimum. With most cleaning products, following the manufacturer's instructions will get the desired results. For heavy scale buildup on tile, ceramics, and porcelain, a pumice stone works nicely.

## ► THE EVAPORATIVE COOLER

Through the evaporation process, minerals accumulate in your evaporative cooler and in the cooler pads. If your water is hard, you may have to change your pads twice per season, depending on how often you use your cooler. If your cooler has a bleed-off valve, make sure that it is adjusted properly in order to ensure circulation of fresh water through the cooler. If the cooler does not have a bleed-off valve, you can minimize mineral buildup by completely flushing the cooler with fresh water once or twice per season. There also are commercially made products available to minimize mineral buildup in the cooler.

## ► DRIP IRRIGATION SYSTEMS

When hard water evaporates, mineral deposits are left on irrigation emitters. Inspect your system regularly and clean clogged emitters either by scraping off the buildup or removing and soaking the emitter in a vinegar and water solution.



## WILL WATER HARDNESS AFFECT MY GARDEN, TREES, OR HOUSE PLANTS?

The high mineral content in hard water may lead to an increase in salt and mineral buildup in the soil when you water your plants, trees, or vegetables. Good drainage is important and soil additives such as gypsum, peat, and compost will be helpful. Use mulches that reduce moisture loss. Native plants will be less sensitive to mineral buildup than exotics, citrus, and vegetables. For more information, you should contact your nursery or landscape professional.

## **WILL THE MINERALS IN HARD WATER CLOG THE WATER PIPES IN MY HOME?**

The calcium in your water will not build up fast enough to limit the useful life of your household plumbing.

The calcium in hard water can create a natural protective coating on the inside of your pipes. If your home has lead or copper pipes or pipes with lead solder, this coating has a beneficial effect by preventing lead and copper from leaching into your home's water supply.

Mineral buildup in sink aerators may restrict water flow. Simply remove the aerator, clean it with vinegar, and replace.

Hot water recirculating systems used by commercial customers, like large boilers in physical plants, are more subject to scale buildup and require close monitoring of those systems.



## **WILL HARD WATER AFFECT MY HEALTH?**

Experts say that the levels of calcium found in hard water are unlikely to cause any increase in kidney stone formation and pose no health problems for the general public. In fact, not drinking enough water is a major contributing factor in kidney stone formation. Persons who have recurring kidney stones, or are on a calcium restricted diet, should consult their physician concerning their diet and liquid intake.

Some people experience more skin dryness with hard water, but the majority of people will not see any change. According to dermatologists, hard water has no effect on skin disorders such as acne, eczema, dermatitis, psoriasis or seborrhea. Hard water should not cause any contact allergy reactions or interact or interfere with any topical skin medications. If you have questions, you may want to consult your dermatologist.

Recent evidence suggests a relationship between higher water hardness and a lower incidence of heart disease.

If you have concerns that are not addressed in this brochure, you may wish to consult your physician.

## SHOULD I GET A HOME WATER SOFTENER?

A water softener can improve the aesthetic qualities of your household water. For example, soap products perform better in softer water. But a water softener does not improve the safety or quality of water as it relates to health.

Most water softeners exchange sodium for existing calcium and magnesium in the water and therefore, increase the sodium content of the water. The sodium increase in softened water may be a concern to you. If you are on a sodium restricted diet, you may want to consult your physician.

There is evidence that softened water may be corrosive to certain metallic pipe materials.

Water softeners also discharge brine into Tucson's wastewater system. These unnatural quantities of salts eventually find their way into the general environment.

The cost of softening water is another factor that must be taken into consideration. According to *Consumer Reports*, water softeners can consume from 15 to 120 gallons of water for every 1,000 gallons of water processed.

The decision to purchase a home water softener is therefore one of personal preference.

### Grains Per Gallon Conversion Chart

*For those people who use water softeners, the following is the formula for converting water hardness in milligrams per liter to grains per gallon.*

<p><b>Milligrams/liter (mg/L)</b> <b>Divided by 17.1 = Grains per Gallon</b></p>
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*example:*

*283 mg/L divided by 17.1 =  
16.5 grains per gallon*

# DRINKING WATER QUALITY CHART

Over 79% of the United States' public water supply comes from surface water sources such as lakes and streams, per the U.S. Geological Survey (USGS). Below is a table comparing hardness and mineral content of the drinking water that comes from treated surface water and groundwater from around the United States. Data from 2004.

Percent Source Water	TUCSON 90-83% Groundwater 10-17% Surface Water – Colorado River	EL PASO 40% Groundwater 60% Surface Water – Rio Grande	FRESNO 85-67% Groundwater 15-33% Surface Water – San Joaquin, Kings Rivers	ANN ARBOR 15% Groundwater 85% Surface Water – Huron River	LAS VEGAS 10% Groundwater 90% Surface Water – Lake Mead	PHOENIX 2% Groundwater 98% Surface Water – Salt, Verde, Colorado Rivers	ST. PAUL 30% Groundwater 70% Surface Water – Mississippi River	INDIANAPOLIS 25% Groundwater 75% Surface Water – White River, Eagle Creek, Fall Creek
Chemical and EPA Drinking Water Quality Standard	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L	Drinking Water Quality average readings in *mg/L
Hardness (as CaCO <sub>3</sub> ) [No Standard]	131	149.5	127.12	136	293	158	79	331
Total Dissolved Solids (TDS) [SMCL* 500 mg/L]	297	639.83	214.15	357	617	607	168	492
Calcium [No Standard]	44	42.5	56	39	72	63	25	86
Magnesium [No Standard]	5.5	10.27	19.2	10	28	29	4	29
Sodium [No Standard]	45	145	19.91	60.8	90	89	16.2	52
Chloride [No Standard]	25	141.33	9.54	112	94	84	40	78
Sulfate [SMCL* 250 mg/L]	56	155.17	10.07	75	258	219	6.6	81
Alkalinity (as CaCO <sub>3</sub> ) [No Standard]	132	106.8	149.6	38	131	140	43	223
pH [SMCL* 6.5-8.5]	7.72 S.U. <sup>†</sup>	8.25 S.U. <sup>†</sup>	8.20 S.U. <sup>†</sup>	9.30 S.U. <sup>†</sup>	7.65 S.U. <sup>†</sup>	7.90 S.U. <sup>†</sup>	9.01 S.U. <sup>†</sup>	7.60 S.U. <sup>†</sup>
Fluoride [MCL‡ 4.0 mg/L]	0.44	0.83	0.01	1.02	0.80	0.48	1.27	1.07
Nitrate (as Nitrogen) [MCL‡ 10mg/l]	1.8	3.77	0.675	0.5	0.481	0.3	0.118	3.3

\*SMCL = Secondary Maximum Contaminant Levels. A number of substances commonly present in tap (drinking) water are not regulated by health-based standards but may affect the taste, odor, and appearance of drinking water. The Environmental Protection Agency sets these advisory levels, known as Secondary Maximum Contaminant Levels for some of these substances.

‡MCL = Primary Maximum Contaminant Levels. A number of substances that can be present in tap (drinking) water are regulated by health-based standards. The Environmental Protection Agency sets these legally enforceable standards to protect the public's health by limiting the amount of these contaminants in drinking water.

<sup>†</sup>S.U. = Standard Units.

No Standard = The Environmental Protection Agency has not set primary or secondary standards for these constituents (or chemicals).

Data reported above was collected from the water departments of the indicated municipalities.

For more information about your water, or the mineral content of the water you receive, call Tucson Water at 791-4331, or visit our website at [www.tucsonaz.gov/water](http://www.tucsonaz.gov/water).



*Thanks to the many staff members from other water utilities, physicians, and health and water professionals who contributed to this brochure by providing expert advice, information, and suggestions for Tucson Water customers.*

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